FINAL
SAMPLING AND ANALYSIS PLAN
FOR OUTDOOR WORKER EXPOSURES AT OPERABLE UNIT 5
LIBBY ASBESTOS SUPERFUND SITE
LIBBY, MONTANA

September 8, 2008

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U.S. Environmental Protection Agency
Region 8
Denver, CO

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This Sampling and Analysis Plan for Outdoor Worker Exposures at Operable Unit 5 of the Libby Asbestos Superfund Site has been prepared by the U.S. Environmental Protection Agency, Region 8, with technical support from Syracuse Research Corporation and CDM, and is approved without conditions.

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TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

List of Acronyms

ABS	Activity-Based Sampling
ASTM	American Society for Testing and Materials
C	Concentration
CFR	Code of Federal Regulations
CO	Colorado
COC	Chain-of-Custody
DQO	Data Quality Objective
eCOC	Electronic Chain-of-Custody
EDD	Electronic Data Deliverable
°F	Fahrenheit
f/cc	Fibers per cubic centimeter
FSDS	Field Sample Data Sheets
FTL	Field Team Leader
GPS	Global Positioning System
GSD	Geometric Standard Deviation
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HQ	Hazard Quotient
ID	Identification
IDW	Investigation-Derived Waste
IFM	Investigation Field Manager
ISO	International Organization for Standardization
L	Liter
LA	Libby Amphibole
MA	Massachusetts
MCE	Mixed Cellulose Ester
MET	Meteorological
mm	millimeter
mph	miles per hour
MT	Montana
NOAA	National Oceanic Atmospheric Administration
OU	Operable Unit
PCM	Phase Contract Microscopy
PLM-VE	Polarized Light Microscopy Visual Area Estimation Method
PLN	Poisson Lognormal
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
RBC	Risk-Based Concentration
RBF	Risk-Based Fraction

RfC	Reference Concentration
SAP	Sampling and Analysis Plan
Site	Libby Asbestos Superfund Site
SOP	Standard Operating Procedure
SRC	Syracuse Research Corporation
TEM	Transmission Electron Microscopy
TWF	Time Weighting Factor
UCL	Upper Confidence Limit
UR	Unit Risk
USEPA	U.S. Environmental Protection Agency
µm	micrometer

1.0 INTRODUCTION

This sampling and analysis plan (SAP) describes the collection and analysis of personal air samples and soil samples intended to estimate current and/or hypothetical future exposure levels of outdoor workers who may disturb soil at various locations in operable unit 5 (OU5) of the Libby Asbestos Superfund Site (Site). This SAP contains all the elements of a field sampling plan and quality assurance project plan, and has been developed in accordance with the U.S. Environmental Protection Agency (USEPA) Requirements for Quality Assurance Project Plans (USEPA 2001) and the Guidance on Systematic Planning Using the Data Quality Objectives Process – USEPA QA/G4 (USEPA 2006). The SAP is organized as follows:

Section 1 – Introduction
Section 2 – Site Description and History
Section 3 – Data Quality Objectives (DQOs)
Section 4 – Sampling Program
Section 5 – Laboratory Analysis Requirements
Section 6 – References
Appendices

1.1 Objectives

Previous investigations have determined that Libby Amphibole asbestos (LA) is present in soil and air at OU5. Therefore, individuals who work outdoors at OU5 could be exposed to LA in soil and/or air. However, the existing data set is not sufficient to estimate the level of LA exposure to current or future workers. Therefore, the objective of this SAP is to collect data of sufficient representativeness and quality to estimate the long-term average level of LA exposure that occurs to individuals who work outdoors and disturb soil at OU5.

1.2 Project Schedule and Deliverables

Two sampling events of one-half day each are expected to be conducted in the interval between September and October 2008.

2.0 SITE DESCRIPTION AND HISTORY

Libby is a community in northwestern Montana located near an open pit vermiculite mine that operated from the 1920's until 1990. The mine began limited operations in the 1920's and was operated on a larger scale by the W. R. Grace Company from approximately 1963 to 1990. Studies at the Site reveal that the vermiculite from the mine contains amphibole-type asbestos, referred to in this report as LA. Epidemiological studies at the Site revealed that workers at the mine had an increased risk of developing asbestos-related lung disease (McDonald et al. 1986, Amandus and Wheeler 1987, Amandus et al. 1987a, b, Sullivan 2007, Rohs et al. 2007). In 2003, Peipins et al. demonstrated radiographic abnormalities in 17.8% of the general population of Libby including former workers, family members of workers, and individuals with no specific pathway of exposure. Although the mine has ceased operations, historic or continuing releases of LA from mine-related materials could be serving as a source of on-going exposure and risk to current and future residents and workers in the area. Since 1999, USEPA has conducted sampling and cleanup activities at the Site related to asbestos-related health problems in the Libby population. The Site was listed on the Superfund National Priority List in February 2002.

The Site has been subdivided into seven operable units to facilitate a phased cleanup approach. OU5 is defined geographically by the parcels of land that include the former Stimson Lumber Mill and is further divided into land use areas based on former mill operations (Figure 2-1). Historical information regarding the Stimson property suggests that asbestos-containing vermiculite products were used at, or transported to, the OU at various times.

Data collected prior to 2007 on the level of LA and vermiculite contamination in soils in OU5 have been summarized in the Final Data Summary Report for OU5 (CDM 2007a). Data gaps in soil (CDM 2007b, Appendix A) were partially filled in 2007 as summarized in the Final Sampling Summary Report (CDM 2008a). This sampling included soil collection and inspection for visible vermiculite in areas of interest and areas not previously sampled including the Libby Groundwater Superfund Site, former nursery area waste bark piles, wood chip piles, banks of Libby Creek, storm water containment and waste water lagoon area, and known areas containing LA in soil or dust. In June 2008, additional data gaps were addressed by performing inspections for visible vermiculite and collecting soil samples from all remaining areas of OU5 that historically were non-detect for LA by Polarized Light Microscopy by Visual Area Estimation (PLM-VE) (CDM 2008b).

Each of the sampling activities demonstrated that the level of visible vermiculite in soil at OU5 is generally low. The majority of soil samples collected in 2002 and 2007 were non-detect for LA by PLM-VE. PLM-VE data from samples collected in 2008 were not

available at the time this SAP was developed. A few areas contained relatively high levels of visible vermiculite, including the former nursery shed area and some areas in the Libby Groundwater Superfund Site. Visible vermiculite recorded during 2007 and 2008 activities is shown in Figure 2-2.

2.1 Conceptual Site Model

Several businesses currently use outdoor portions of OU5 for manufacturing wood and metal products, storage space, and rail car access (CDM 2007a). Future use of the OU may include redevelopment into commercial lots (CDM 2007a). Workers at OU5 could be exposed to LA in air resulting from disturbance of soil while working outdoors. A conceptual site model for OU5 is shown in Figure 2-3. The current and future pathways of concern to be evaluated specific to OU5 by the sampling described in this SAP are highlighted in Figure 2-3. Additional pathways of concern have been evaluated by past sampling plans or by sampling plans that are currently in development.

3.0 DATA QUALITY OBJECTIVES

The DQO process is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. USEPA has issued guidelines to help data users develop site-specific DQOs (USEPA 2006). These guidelines were followed for the development of the DQOs presented in this section.

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The DQO process consists of seven steps; output from each step influences the choices that will be made later in the process. These steps include:

1. State the problem
2. Identify the decision
3. Identify the inputs to the decision
4. Define the study boundaries
5. Develop a decision rule
6. Specify tolerable limits on decision errors
7. Optimize the design

These steps are implemented below.

3.1 Step 1 – State the Problem

The purpose of this step is to describe the problem to be studied so that the focus of the investigation will be unambiguous.

The problem to be addressed in this effort is that current or future outdoor workers in OU5 may engage in activities that disturb soil, resulting in release of LA from the soil into breathing zone air. However, available data are not sufficient to estimate the levels of LA in air that may be encountered, or to characterize how those levels depend on the level of LA in soil. These data are needed to support exposure and risk assessment at OU5, and to determine if a response action is required to protect the health of those who work outdoors in OU5.

3.2 Step 2 – Identify the Decision

This step identifies what questions the investigation will attempt to resolve and what actions may result.

The decision to be made is whether or not USEPA needs to take any action within OU5 to ensure health protection for current or future outdoor workers who may be exposed by activities that disturb contaminated soil in the OU.

Note: In making this decision, it is important to emphasize that the basis for assessing human health risk from cancer due to asbestos exposure is currently undergoing USEPA review, and the approach may be revised in the future as new methods are developed and as new toxicity data on asbestos are obtained. In addition, USEPA has not yet developed a method for assessing non-cancer risks from inhalation exposure to asbestos. Thus, all evaluations of public health protectiveness that are based on currently available risk assessment methods should be viewed as interim, and these interim decisions may be revised in the future as methods and data for assessing the cancer and non-cancer risks of asbestos are improved.

3.3 Step 3 – Identify the Inputs to the Decision

The purpose of this step is to identify the environmental data that need to be obtained and measurements that need to be taken to resolve the decision statement.

The data needed to achieve the objective of this effort consist of reliable and representative measurements of LA concentrations in the breathing zone of individuals who disturb soil while engaged in a range of activities that, taken together, are representative of an outdoor worker at the OU. For convenience, collection of personal air monitoring samples from individuals who are engaged in activities that may cause release of asbestos from soil into air is referred to as "activity-based sampling" (ABS).

3.3.1 Sampling Locations

In order to characterize how the level of LA in air might depend on the level of LA and/or vermiculite in soil, ABS sampling will be conducted over a range of levels of LA and/or vermiculite in soil. Previous sampling activities (CDM 2007b, 2008b) have characterized vermiculite levels by visual inspection. These data can be used to roughly categorize the soil at OU5 into one of 4 levels, based on relative scoring. ABS data will be collected from each of the four categories identified in Table 3-1. This stratification will help increase the ability to determine if a clear exposure-response relationship can be detected.

Verification soil sampling and inspection for visual vermiculite will be conducted at eight specific ABS locations (2 locations from each category of contamination). Soils have been previously characterized by PLM-VE at OU5. Therefore, soils collected for PLM-VE analysis for the purposes of this SAP will be archived until such a time as it is determined that further characterization of the soil is needed. These attributes of the source material may be useful if cleanup action is needed, or if the ABS data from this location are proposed for use at other locations.

3.3.2 Types of Air Samples

Experience at Libby and at other sites has demonstrated that, in general, higher concentrations of asbestos are measured in personal air samples (i.e., samples that collect air in the breathing zone of a person) than air samples collected by a stationary monitor, especially if the person is engaged in an activity that disturbs an asbestos source such as contaminated soil. Because of this, this SAP will focus on the collection of personal air samples during ABS.

3.3.3 Target Analyte List

Each air sample will be analyzed for asbestos. Specific methods and counting rules are provided in Section 5. Results will include the size (length, width) of each particle, along with the mineral classification (LA, other amphibole, chrysotile).

3.3.4 Types of Soil Disturbances

Outdoor workers may disturb soil in OU5 by a wide variety of different activities. Conceptually, the ideal data set would include ABS data from many different types of disturbances that span the full range of intensities that may occur under commercial land use. However, it is not feasible to evaluate every possible type of disturbance. Rather, this assessment will focus on two standardized activities which are considered to be general examples of relatively vigorous disturbances:

- Raking with a metal-tined leaf rake
- Maneuvering heavy equipment

3.3.5 Soil Condition Data

The amount of LA released from an ABS event depends on both the level of contamination in the soil and the condition of the soil at the time of the ABS event. Therefore, the following data items will to be collected during ABS:

- The level of LA and/or vermiculite in soil within the ABS scenario area, as measured by PLM-VE and visible inspection
- Nature and extent of soil vegetative cover (documented in field logbook and photographs)
- Soil moisture
- Soil texture

3.4 Step 4 – Define the Boundaries of the Study

Spatial Bounds

This investigation is limited to areas located within OU5, although the results may be applicable to other similar areas located outside OU5. The size of the area used for the

ABS measurements should be similar to the area over which a worker at a commercial facility might reasonably be exposed when working outdoors over the course of multiple years. No data were located to help define this size, but based on previous observations and professional judgment, a range of about 1-1.5 acres is anticipated.

Temporal Bounds
The releasability of LA from soil to air is expected to vary as a function of time of year (season) resulting in variations of soil moisture content, ground cover, and weather conditions. Therefore, characterization of LA levels in ABS air samples requires collection of samples at repeated times during the year, along with a characterization of the conditions of the soil during the time of the activity. For the purposes of this effort, sampling will occur over a relatively narrow time window (late summer and early fall of 2008). This time period is likely to represent the high end of the LA-releasability range, since soils are likely to be relatively dry in this time interval. Sampling in other seasons (e.g., spring) may be performed at a later date, depending on how the data estimate the mean exposure and the uncertainty around the exposure as described in Section 3.7.

During days when ABS activities are scheduled, meteorological (MET) weather station data will be downloaded from the local National Oceanic Atmospheric Administration (NOAA) station.

LA levels in soil are not expected to vary as a function of time, but the soil LA characterization event will take place as close as possible to the ABS sampling event for consistency. Other soil parameters including moisture and vegetative cover will vary as a function of season and day and will be collected concurrently with ABS.

Activity bounds
Release of LA from soil is expected to be influenced by the nature of the soil disturbance activity that occurs. Because the purpose of this assessment is to characterize releases associated with a generic outdoor worker scenario, the activities and behaviors that will be used to disturb the soil are selected to be generally representative of the wide range of different activities an outdoor worker might engage in. Appendix A provides the detailed "script" of the activities that will be included in the generic outdoor worker scenario. These activities are selected to be representative of average to high-end disturbances that outdoor workers may experience.

3.5 Step 5 – Develop Decision Rules

USEPA has not determined a final decision rule for assessing human health protectiveness at the Site, but it is expected that the rule which will ultimately be adopted will take a form similar to the following:

If the level of risk to workers at a specified sub-area of OU5, when combined with the level of risk which applies to the same individuals from other applicable exposure pathways, does not exceed a cancer risk of 1E-04 or a non-cancer Hazard Quotient (HQ) of 1.0, then risks at that sub-area will be considered acceptable. If the total risk exceeds a cancer risk of 1E-04 or an HQ of 1.0, then the feasibility of further reducing exposure from the outdoor air pathway and/or the other applicable exposure pathways shall be assessed.

At present, USEPA has not developed a quantitative procedure for evaluating non-cancer risks, but has developed a method for quantification of cancer risk (IRIS 2007). The basic equation is:

$$Risk(i) = C(i) \cdot TWF(i) \cdot UR(i)$$

where:

Risk(i) = Risk of dying from a cancer that results as a consequence of exposure from specified exposure scenario "i"

C(i) = Average concentration of asbestos fibers in air (fibers per cubic centimeter [f/cc]) during exposure scenario "i"

TWF(i)= Time weighting factor for exposure scenario "i". This factor accounts for less-than-continuous exposure during the exposure interval.

UR(i) = Unit Risk (f/cc)-1 that is appropriate for exposure scenario "i"

As noted above, because of limitations in the current methods for assessing risks from asbestos, all decisions regarding residual risk levels are considered interim, and interim decisions may be revisited in the future as new methods and new data become available.

3.6 Step 6 – Specify Tolerable Limits on Decision Errors

In making decisions about the long-term average concentration of LA in outdoor air and the level of health risk associated with that exposure, two types of decision errors are possible:

1. A false negative decision error would occur if a risk manager decides that exposure to LA in outdoor air is not of significant health concern, when in fact it is of concern.

2. A false positive decision error would occur if a risk manager decides that exposure to LA in outdoor air is above a level of concern, when in fact it is not.

USEPA is most concerned about guarding against the occurrence of false negative decision errors, since an error of this type may leave humans exposed to unacceptable levels of LA in outdoor air. For this reason, it is anticipated that decisions regarding this pathway will be based not only on the best estimate of the long term average concentration, but will also consider the 95% upper confidence limit (UCL) of the long-term average concentration. Use of the UCL to estimate exposure and risk helps account for limitations in the data, and provides a margin of safety in the risk calculations, ensuring that risk estimates are unlikely to be too low.

USEPA is also concerned with the probability of making false positive decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources. For the purposes of this effort, the strategy adopted for controlling false positive decision errors is to seek to ensure that, if the exposure estimate based on the 95% UCL is above USEPA's level of concern for this pathway, then the UCL is not larger than 3-times the best estimate of the mean. If the 95% UCL is at or above the range that is of potential concern, and the UCL is greater than 3 times the best estimate of the mean, then it will be concluded that there is a substantial probability of a false positive error and that more data may be needed to strengthen decision-making.

3.7 Step 7 – Optimize the Design for Obtaining Data

3.7.1 LA in Soil

For soil, the best method currently available for asbestos yields semi-quantitative results, and the uncertainty around each measurement can not be quantified. Thus, there is no statistically valid approach for deriving a quantitative estimate of the mean for a set of samples, or to quantify the uncertainty about the mean. In the absence of a valid statistical approach, based on general statistical principles, USEPA has determined that a data set of about 30 composite points per sampling area is likely sufficient in order to have a semi-quantitative understanding of spatial variability of soil levels in the sampling area. A composite sample will be collected in each area in the event that PLM-VE analysis is needed at a later date.

3.7.2 LA in Air

Estimating the Number of Samples

The method used to compute the UCL of a set of outdoor air samples depends on the statistical properties of the data set. If it is assumed that the variability between different samples is likely to be approximately lognormal, then the data set collected from a location or a set of similar locations may be approximated by a mixed Poisson lognormal (PLN) distribution. At present, the USEPA has not established a method for quantifying the uncertainty in the mean of a data set drawn from a PLN distribution, so it is not currently possible to perform a quantitative analysis of decision error rates as a function

of sample size. However, it is known that the magnitude of the uncertainty around an observed sample mean depends on three key variables:

1. as the variability in the underlying distribution increases, uncertainty increases
2. as the number of samples collected increases, uncertainty decreases
3. as the number of particles counted per sample (lamda) increases, uncertainty decreases

The relationship between these three variables and the sampling distribution of the mean of a PLN can be characterized using Monte Carlo simulation. For the purposes of this effort, the underlying distribution was assumed to be lognormal with a geometric standard deviation (GSD) of 3, 6 or 10. Random data sets of varying sample size (5 to 80) were drawn. Each sample was assumed to be analyzed by a procedure with random Poisson counting error, with the average number of particles counted per analysis (lamda) ranging from 3 to 20. The mean of each simulated data set was computed, and divided by the true mean in order to normalize the values.

The results (presented as the range from the 5th percentile to the 95th percentile of the ratio of the simulated mean divided by the true mean) are shown in Figure 3-1. As seen, relatively little reduction in variability is gained by increasing lamda from 5 to 20, so analytical strategies designed to yield an average of 5 or more particles per sample are considered appropriate. The number of samples needed to limit the uncertainty in the mean to an acceptable level depends on how close the mean is to the decision criterion and on the degree of underlying variability (as reflected in the GSD). If the GSD is not excessive (e.g., about 3-6), and if the mean is well removed from a level of concern (e.g., more than a factor of 3), then the number of samples needed is likely on the order of 10 to 15, depending on the degree of underlying variability. If the mean is close to a level of concern (e.g., less than a factor of 2), then the number of samples needed is likely on the order of at least 25 to 50, depending on the underlying variability (GSD).

At present, data are not available to estimate how close the mean is to a level of concern, or on the magnitude of the underlying variability. In the absence of such data, the minimum number of samples to be collected in this effort is 20. This should be sufficient to support decision making if variability is not too high (GSD $\approx$ 3) and if the observed mean concentration is not too close to decision thresholds (e.g., more than a factor of 3). Additional sampling may be needed to support decision-making if variability is high (e.g., GSD > 3) and/or observed means are close to decision thresholds (e.g., sample mean is within 3-fold of the decision threshold). This evaluation will be guided by the relationships illustrated in Figure 3-1.

Estimating the Required Analytical Sensitivity

For the purposes of this effort, the analytical sensitivity that is needed for analysis of outdoor air samples is estimated in a series of steps, as follows:

1. Select a risk level of potential concern
2. Calculate the concentration of LA that corresponds to the selected risk level
3. Set the target analytical sensitivity such that, if the average concentration of LA were close to the concentration of concern, the analysis would yield a reliable quantification of the concentration

The level of potential concern selected for computing the analytical sensitivity for the outdoor worker scenario is a cancer risk of 1E-05 (1 in 100,000) or a non-cancer HQ of 0.1. These levels are 1/10 the total level of concern to USEPA.

The concentration of LA in outdoor air that is associated with a risk level of 1E-05 is referred to as the risk-based concentration (RBC), and is calculated from the basic risk equations described above by solving for the concentration that yields a risk of 1E-05:

$$RBC = 1E\text{-}05 / (TWF \bullet UR)$$

Note that the RBC is expressed in terms of the type of fibers defined by the risk model. For example, the current USEPA approach is based on phase contrast microscopy (PCM) fibers, which are defined as asbestos fibers longer than 5 μm, thicker than 0.25 μm, and with an aspect ratio greater than 3:1. For convenience, the fibers used in a risk model are called "risk-based fibers". In most cases, the risk-based fibers are only a sub-set of the total asbestos fibers present in air. The fraction of fibers that are risk-based is referred to as the "risk-based fraction" (RBF):

$$RBF = C(\text{risk-based}) / C(\text{total})$$

Combining yields:

$$RBC\ (\text{total LA f/cc}) = 1E\text{-}05 / (RBF \bullet TWF \bullet UR)$$

The value of RBF (the fraction of total LA fibers that are PCM equivalent fibers) for OU5 is not known, but data collected during ABS studies at other parts of the Site indicate a value of about 0.3 to 0.5. Based on this, a value of 0.4 is assumed for these calculations.

Site-specific data on frequency and duration of worker exposures during soil disturbance activities are not currently available. Therefore, for the purposes of this sampling design,

the following activity parameters are assumed based on occupational exposure parameters and professional judgment:

- Exposure time = 8 hours per day
- Exposure frequency = 200 days per year
- Exposure duration = 25 years (from age 20 to age 45)

Based on this, the value of TWF is computed as follows:

$$TWF = 4 \text{ hr}/24 \text{ hr} \bullet 200 \text{ days}/ 365 \text{ days} = 0.18$$

The value of UR based on exposure of 25 years from age 20 to 45 is derived by extrapolation from the table of unit risk values reported in USEPA, 1986. Based on the extrapolation, the value of unit risk for this scenario is:

$$UR_{20\text{-}45} = 0.069 \text{ (PCM f/cc)}^{-1}$$

Based on these inputs, the concentration of LA in air that corresponds to a risk of 1E-05 in outdoor workers is calculated as:

$$RBC = (1E\text{-}05) / (0.4 \bullet 0.18 \bullet 0.069) = 0.002 \text{ total LA f/cc}$$

In order to ensure that this concentration would be readily detectable if it were present, the target analytical sensitivity is set to a level about 1/2 the RBC:

$$S = 0.001 \text{ cc}^{-1}$$

As noted above, the USEPA has not yet developed a method for evaluating non-cancer risks from asbestos, so it is not yet possible to compute an analogous level of concern for non-cancer effects. In the absence of data, it is tentatively assumed that the target analytical sensitivity that is adequate for evaluating cancer risk will also be sufficient for evaluating non-cancer risks. USEPA toxicologists are currently working to develop an reference concentration (RfC) for asbestos based on available data on LA and other forms of asbestos, and this assumption will be re-visited when an RfC is approved for use.

A summary of the design details presented in this section can be found in Table 3-2.

4.0 SAMPLING PROGRAM

This section provides the details related to the sampling program required to meet the DQOs (Section 3).

4.1 Pre-Sampling Activities

Prior to beginning field sampling activities, a field planning meeting will be conducted, any required trainings will be conducted, and an inventory of equipment and supplies will be performed to ensure that all necessary supplies and equipment are available and in good working order.

4.1.1 Field Planning Meeting

The field planning meeting will be conducted by the assigned CDM field team leader (FTL) and attended by the field staff, a member of the CDM quality assurance (QA) staff, a member of the CDM field health and safety staff. The USEPA remedial project manager will be notified of the meeting's date and time. The agenda will be reviewed and approved by the QA staff and the health and safety officer prior to the meeting. The meeting will briefly discuss and clarify the following:

- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- Required quality control (QC) measures
- Health and safety requirements
- Documents governing fieldwork that must be on site
- Any changes in the field planning documents

A written agenda, reviewed by the CDM QA staff, will be distributed and an attendance list signed. Copies of these documents are maintained in the project files, in the CDM Denver, Colorado (CO) office. Additional meetings will be held when the documents governing fieldwork require it or when the scope of the assignment changes significantly. The field team personnel will perform the following activities before and during field activities, as applicable:

- Review and understand applicable governing documents
- Ensure that all sample analyses are scheduled through the laboratory
- Obtain required sample containers and other supplies

- Obtain and check field sampling equipment
- Obtain and maintain personal protective equipment (PPE)

4.1.2 Training Requirements

Prior to starting work at the Libby field office, any new team member must complete the following, at a minimum:

- Read the Comprehensive Site Health and Safety Plan (HASP) (CDM 2006) – documented on plan signature sheet and required reading report
- Read the Libby Asbestos Project HASP (CDM 2008c) – documented on plan signature sheet and required reading report
- Read the HASP for Outdoor Worker ABS in OU5- documented on plan signature sheet and required reading report
- Attend an orientation session with the site health and safety officer – documented on orientation session attendance sheet
- Read and understand all relevant governing documents – documented on required reading report
- Occupational Safety and Health Administration 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and relevant 8 hour refreshers – documented by training certificates
- Current 40 hour HAZWOPER Medical Clearance
- Respiratory protection training as required by 29 Code of Federal Regulations (CFR) 1910.134 – documented by training certificate
- Asbestos awareness training as required by 29 CFR 1910.1001 – documented by training certificate
- Sample collection techniques – documented by logbook entries

All training documentation will be stored in the Libby project files.

4.1.3 Inventory and Procurement of Equipment and Supplies

The following equipment will be required for sampling activities, and any required equipment not already contained in the field equipment supply inventory will be procured prior to initiation of sampling activities:

- Field logbooks
- Indelible ink pens
- Digital camera

- Video camera
- Air sampling equipment
    - 25 millimeter (mm) diameter mixed cellulose ester (MCE) filter cassettes (0.8 micrometer (µm) pore)
    - High flow rate, battery-powered air sampling pumps
    - Rotameter
- 20-28 inch wide metal leaf rake
- Bobcat
- Sampling backpack
- Soil sampling equipment
    - Steel bowl
    - Trowel or shovel
- Sample paperwork and sample tags/labels
- Custody seals
- Zipper-top baggies
- PPE as required by the HASP

4.1.4 Identify Sampling Areas

Based on the distribution of visible vermiculite at OU5, eight locations corresponding to 2 areas in each category (Table 3-1) were selected. These locations are shown in Figure 4-1. ABS will be conducted within these approximate locations; however, due to the changing conditions at OU5, the final sampling areas will be determined at the time of sampling, but will be chosen based on similar characteristics as described in Section 3.1.1. Each sampling area will span relatively the same area, approximately 1 - 1.5 acres, depending on site conditions at the time of sampling.

4.2 Sample Collection

The following sections describe the sample collection procedures for air and soil.

4.2.1 Soil Sample Collection

Figure 4-1 depicts the site subdivided into 8 sampling areas to represent the four contamination categories detailed in Table 3-1. In each area, the soil will be inspected for visual vermiculite at 30 inspection points per area. In addition, one 30-point composite soil sample will be collected for archive so that the entire area is represented by the sample. Soil samples will be collected and homogenized in accordance with the Site-Specific Standard Operating Procedures (SOP) CDM-LIBBY-05, Revision 2; Soil Sample Collection at Residential and Commercial Properties (Appendix B) except that the soil will not be wetted with water before collection.

In order to ensure that sufficient sample is available for potential future investigations, the mass of the composite sample must be no less than 2.0 kg.

A sketch of each sampling area will also be prepared. The sketch will indicate the approximate location and level of any visible vermiculite. This will be done in accordance with the Site-Specific SOP CDM-LIBBY-06, Revision 1; Semi-Quantitative Visual Estimation of Vermiculite in Soil (Appendix B) with the following modifications:

The entire area will be inspected for visual vermiculite regardless of previous excavations or presence of LA. Semi-quantitative estimates of vermiculite observed during sample collection will be recorded on Field Sample Data Sheet (FSDS) and not on the Visual Vermiculite Estimation Form.

Soil sampling and observations shall occur close to the time that the ABS is conducted. If these cannot be carried out in sequence (within the same 24-hour period of the first day of air sampling), the field team will note this in the field logbook.

Soil moisture will be estimated daily for each area by the hand appearance method that provides results in percent of field capacity. This is performed by firmly squeezing a handful of soil and comparing the results to the table below. For each area, soil used for this evaluation will be collected from a minimum of 5 locations between 0 and 2 inches below ground surface. There is not a lower limit for soil moisture deficiency but ABS scenarios will not be conducted if standing water or rain is observed within the scenario area during sampling. The soil moisture result for each area will be recorded in the field logbook.

Field Test for Moisture Content – Interpretation Table			
% Soil Moisture Deficiency	Moderately coarse texture	Medium texture	Fine and very fine texture
0 (field capacity)	Upon squeezing, no free water appears on soil but wet outline of ball is left on hand.		
0 to 25	Forms weak ball, breaks easily when bounced in hand.*	Forms ball, very pliable, slicks readily.*	Easily ribbons out between thumb and forefinger.*
25 to 50	Will form ball, but falls apart when bounced in hand.*	Forms ball, slicks under pressure.*	Forms ball, will ribbon out between thumb and forefinger.*
50 to 75	Appears dry, will not form ball with pressure.*	Crumbly, holds together from pressure.*	Somewhat pliable, will ball under pressure.*
75 to 100	Dry, loose, flows through fingers.	Powdery, crumbles easily.	Hard, difficult to break into powder.
*Squeeze a handful of soil firmly to make ball test.			

In addition to estimating soil moisture content in the field, 10% of soil samples collected will be analyzed for moisture content using American Society for Testing and Materials (ASTM) Method D2216-05: Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

Soil texture of each area will be determined at the time of soil sample collection as prescribed by United States Department of Agriculture, Natural Resources Conservation Service techniques (Appendix B). The result will be recorded in the field logbook.

Extent of vegetative cover will be estimated at the start and end of each sampling event and will be recorded in the field logbook.

4.2.2 Air Sample Collection

Personal air samples will be collected from USEPA contractors who will perform activities in accordance with the outdoor worker script provided in Appendix A. The goal is to collect a minimum of 4 samples at each ABS area, with these samples being spaced out over time to ensure temporal representativeness. Therefore, at each location selected for evaluation, 2 workers will engage in the scenario in each of the 8 areas at 2 different sampling times. The total number of samples (32) is expected to yield an estimate of the mean concentration that has acceptable uncertainty bounds.

SOP EPA-Libby-01, Revision 1, March 2001 will be used for collection of personal air samples during this effort. A copy of this SOP is presented in Appendix B. All air samples will be collected using cassettes that contain a 25 mm diameter MCE filter with a pore size of 0.8 μm.

The air sampling pump will be carried in a backpack worn by the participant or otherwise placed immediately next to the participant. The personal air samples will be collected using battery-powered sampling pumps capable of operating at high flow rates. The specific model selected for this sampling event is F&J DF-40L-8. The monitoring cassette will be affixed to the shoulder of the participant by trained USEPA staff such that the cassette is within the breathing zone. The breathing zone can be visualized as a hemisphere approximately 6 to 9 inches around an individual's face. The top cover from the cowl extension on the sampling cassette shall be removed ("open-face") and the cassette oriented face down.

Sampling duration and pump flow rate will be adjusted to yield sample volumes of about 1200 liters (L). Assuming that each outdoor worker scenario lasts about 120 minutes, the pump flow rate will be set to 10 L/minute.

As part of this activity, personal air samples will also be collected on the first three days of sampling for ongoing health and safety monitoring and are not intended for use in the risk assessment. To differentiate these samples from the other personal air samples collected as part of this sampling effort, "PCM" will be used in the Sample Location Description field of the FSDS. These samples will be collected in accordance with the Response Action SAP, Revision 1 (CDM 2008d) and will represent both the time weighted average and excursion sampling periods.

4.2.3 Pump Calibration

Each air sampling pump will be calibrated at the start and end of each sampling period using a rotameter that has been calibrated to a primary calibration source. The primary calibration standard used at the Site is a Bios DryCal® DC-Lite. For pre-sampling purposes, calibration will be considered complete when ±5 percent of the desired flow rate is attained, as determined by three measurements with the calibrator using a cassette reserved for calibration (from the same lot of the sample cassettes to be used in the field). For post-sampling, three separate constant flow calibration readings will be obtained with the sampling cassette inline and those flow readings will be averaged. If the flow rate changes by more than 5 percent during the sampling period, the average of the pre- and post-sampling rates will be used to calculate the total sample volume.

Samples for which there is more than a 25% difference from initial calibration to end calibration will be invalidated. The sample collector will record the pump serial number,

sample number, initial flow rate, sample start/end times, sample locations, and final flow rate in the field logbook and on a FSDS.

To prevent potential cross-contamination, each rotameter used for field calibration will be transported to and from each sampling location in a sealed zip-top plastic bag. The cap used at the end of the rotameter tubing will be replaced each morning after it is used.

4.2.4 MET Station Data

During days when ABS activities are occurring, MET station data will be downloaded from the local NOAA station, LBBM8. The following parameters are recorded hourly at this station:

- temperature (degrees Fahrenheit [°F])
- dew point (°F)
- relative humidity (%)
- wind speed (miles per hour [mph])
- wind gust (mph)
- wind direction
- solar radiation (watts per square meter per hour)
- precipitation (inches)

Copies of all MET station data will be provided to USEPA and Syracuse Research Corporation (SRC) within one week after the completion of the sampling event. Electronic copies are suitable and will be placed in the project e-room.

4.3 General Processes

4.3.1 Sample Labeling and Identification

Samples will be labeled with index identification numbers supplied by field administrative staff, and will be signed out by the sampling teams (i.e., controlled). For air samples, one sample label will be placed on the sampling cassette and the sample identification number will also be written on the outside of the plastic bag used to hold the sampling cassette during transport. For soil samples, the sample label will be affixed to the inside of the inner zip-top plastic bag as well as hand-written on the outside of the bag. The sample will be double bagged and the labeling process will be repeated for the outer bag.

Sample index identification numbers will identify the samples collected during this sampling effort by having the following format:

SL-#####

where:

SL	=	Stimson Lumber Mill Site
#####	=	a sequential five digit number

4.3.2 Field Logbooks

Field logbooks will be maintained in accordance with CDM SOP 4-1, Field Logbook Content and Control with project-specific modifications (Appendix B). The log is an accounting of activities at the site and will duly note problems or deviations from the governing plans and observations related to the SAP.

As described in CDM SOP 4-1, logbook modifications will be completed with a single line strikeout, initial, and date. The correct information should be entered in close proximity to the erroneous entry.

Field logbooks will be completed daily prior to leaving the site. Field logbooks will be checked for completeness and adherence to CDM SOP 4-1, on a daily basis for the first week of each new activity. When incorrect logbook completion procedures are discovered during these checks, the errors will be discussed with the author of the entry and corrected.

The field administrative staff will manage the logbooks by assigning unique identification numbers to each logbook, tracking who each logbook was assigned to, the investigation activities to be recorded in each logbook, the date the logbook was signed out, and the date the logbook was returned. As logbooks are completed, originals will be maintained in the CDM office in Libby, Montana (MT) and copies will be sent for archive to the CDM office in Denver, CO. Copies of logbooks will be provided to USEPA and SRC within one week after the completion of the sampling event. Electronic copies of all logbooks are suitable and will be placed in the project e-room.

4.3.3 FSDSs

Detailed sampling notes as required by media-specific FSDSs will be recorded for each field and QC sample. FSDSs are property-specific and up to 3 individual samples can be recorded on a FSDS from the same property. If columns are left incomplete due to less than three samples being recorded on a sheet, the blank columns will be "Z'ed" out and signed by the staff member completing the sheet. Modifications will be completed with a single line strikeout, initial, and date. For any information mistakenly recorded on a sheet. The correct information should be entered in close proximity to the erroneous entry.

FSDSs will be completed in the field before leaving the sampling location. To ensure that all applicable data is entered and all necessary fields are completed, a different field team member will check each FSDS. Initials are placed on the FSDS indicating the team member who completed the form and the team member who checked the form. In addition, the FTL will also complete periodic checks of FSDS prior to relinquishment to the sample coordinator. Once FSDSs are relinquished to the sample coordination staff, the sheets are again checked for accuracy and completeness. Initials are recorded on the sheet for the member of the sample coordination staff completing the check and data entry of required information into the project sample tracking database, eLASTIC.

During any of these checks, if a revision is required to the FSDS, it will be returned to the team member initially responsible for its completion. The error will be explained to the team member and the sheet corrected.

Each media-specific sheet is assigned a unique identification number. This number will be referenced in logbook entries related to samples recorded on individual sheets. Field administrative staff will manage the FSDSs and will send copies of completed sheets to the project repository at the CDM office in Denver, CO. Original sheets will be filed in the CDM office in Libby, MT office by media and individual sheet number.

Copies of the FSDSs that will be used to record information collected during the activities described in this SAP are shown in Appendix C. Copies of FSDSs will be provided to USEPA and SRC within one week after the completion of the sampling event. Electronic copies are suitable and will be placed in the project e-room.

4.3.4 Photographic Documentation

Photographs will be collected to document sampling locations and site conditions during ABS activities and at any other place the field sampling personnel determine necessary, with a digital camera in accordance with CDM SOP 4-2, Photographic Documentation of Field Activities (Appendix B) with the project-specific modifications.

Digital photographs will be archived on the CDM Libby Server (secure) with nightly backup. These files will be archived until project closeout, at which point project management will determine a long-term electronic file storage system. Electronic captions will be used to describe the photographs instead of maintaining photographic logs in daily logbook entries. File names will be in the format:

OU5_date

where

OU5 indicates the activity was completed at OU5, and the date is formatted as MM-DD-YY.

4.3.5 Videotape Documentation

A videotape will be prepared to document a representative example of ABS scenarios including any special conditions or circumstances that arise during the activity. File names will be in the same format as photographic documentation listed above.

4.3.6 GPS Point Collection

Global positioning system (GPS) location coordinates will be collected for soil samples in accordance with Site-Specific SOP CDM-LIBBY-09; GPS Coordinate Collection and Handling (Appendix B). General procedures used for GPS point collection are discussed below:

- For composite soil samples, a GPS point is collected at the approximate center of each sample area. In the case of an irregularly shaped sample area or sample area that is non-continuous, such as a flowerbed that wraps around a house, a GPS point is collected at the center of the largest continuous sample area.

GPS data is not collected for the following types of samples:

- Soil duplicates – the same location identification (ID) number is used for the parent and the field duplicate samples, resulting in the same X, Y coordinates.
- Personal air samples – the locations for these samples are the same coordinates assigned to the property or building where the samples were collected.

To ensure proper collection of GPS data the following criteria have been established at the site for data with accuracy to ± 1 meter:

- The operator of the GPS unit must be standing at the sample location before the data collection begins.
- Once the unit begins collection of location data, the operator must remain standing at the sample location until the minimum required data points have been collected.
- A minimum of 30 data points must be collected at each XY coordinate.
- GPS collection is completed when the position dilution of precision (PDOP) is less than 4.5.

4.3.7 Field Equipment Maintenance

Field equipment maintenance will be conducted and documented as described in CDM SOP 5-1, Control of Measurement and Test Equipment (Appendix B).

When a piece of equipment is found to be operating incorrectly, the piece of equipment will be labeled out-of-order and placed in a separate area from the rest of the sampling equipment. The person who identified the equipment as out-of-order will notify the FTL overseeing the investigation activities. It is the responsibility of the FTL to facilitate repair of the equipment. This may include having appropriately trained field team members complete the repair or shipment to the manufacturer.

4.3.8 Equipment Decontamination

Decontamination of air sampling pumps and soil sampling equipment will be conducted in accordance with CDM SOP 4-5, Field Equipment Decontamination at Non-radioactive Sites, with project specific modifications (Appendix B). Materials used in the decontamination process will be disposed of as investigation derived waste (IDW) as described below

4.3.9 Handling IDW

Any disposable equipment or other IDW will be handled in accordance with CDM SOP 2-2 with project-specific modifications, Guide to Handling of IDW (Appendix B).

During periodic evaluations conducted by the FTL, IDW handling will be evaluated. If handling procedures are not following CDM SOP 2-2 and project-specific requirements, the field teams observed will be re-instructed on correct handling procedures.

4.3.10 Field Sample Custody and Documentation

Field sample custody and documentation will follow the requirements as stated in CDM SOP 1-2, Sample Custody with project-specific modification (Appendix B). The chain of custody (COC) is used as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. A complete COC is required to accompany each shipment of samples.

At the end of each day, all samples will be relinquished to the sample coordinator by the sampling team following COC procedures, and an entry will be made into the logbook indicating the time samples were relinquished. The sample coordinator will follow COC procedures to ensure proper sample custody from acceptance of the sample from the field teams to shipment to the laboratory.

The sample coordinator assistant will use the FSDS to complete an electronic COC (eCOC). The sample coordinator will use the data entered to create the eCOC and verify the data against the FSDSs. Three paper copies of the eCOC will then be generated. One copy will be filed in the CDM office in Libby, MTand the other two will accompany the sample shipment. If any errors are found on an eCOC after shipment, the paper copy of the COC stored in Libby will be corrected by the sample coordinator with a single line

strikeout, initial, and date. The corrected copy will be faxed to the Volpe Center in Cambridge, Massachusetts (MA) and the receiving laboratory. The fax to the Volpe Center will be used to update the Libby2 database.

Copies of all COC forms will be provided to USEPA and SRC within one week after the completion of the sampling event. Electronic copies are suitable and will be placed in the project e-room.

4.3.11 Laboratory Coordination

In order to clearly differentiate the samples collected for this investigation, each COC will reference the SAP-specific Summary of Preparation and Analytical Requirements for Asbestos (provided in Appendix D) in the comments section for each sample. In addition, each COC will be appended with this analytical summary sheet.

4.3.12 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with CDM's SOP 2-1, Packaging and Shipping of Environmental Samples (Appendix B), with project-specific modifications. For air samples, a custody seal will be placed so that both ends of the sampling cassette are covered by the seal. Custody seals will be placed over at least two sides of the cooler and then secured by tape if samples are released to a non-sampler. The sample coordinator will check the COC versus the samples in the shipment to ensure the COC matches shipment contents.

The sample coordinator will be responsible for shipment of samples. All samples will be shipped by an overnight delivery service to the laboratory designated by the CDM laboratory coordinator or hand-delivered to the onsite laboratory. Vermiculite, shredded paper, or expanded polystyrene cannot be used as packing material.

4.3.13 Modification Documentation Forms

All deviations from this SAP and associated guidance documents will be recorded on the Libby Asbestos Project Record of Modification Form (Appendix E). The Record of Modification Form will be used to document all permanent and temporary changes to procedures contained in guidance documents governing investigation work. In addition, the Record of Modification Form will be used to document any information of interest as requested by USEPA project management. As modifications to governing documents are implemented, the FTL will communicate the changes to the field teams conducting activities associated with the modification. When the USEPA project management team determines the need, revised governing documents may be issued to incorporate modifications.

Record of Modification Forms are completed by the FTL overseeing the investigation. Once a form is completed a technical review is completed by the Volpe Center project

manager or designate, and then reviewed and approved by the USEPA project leader or designate.

A record is kept to track the person each form was completed by and a brief description of the modification documented on each form. Each completed Record of Modification Form is assigned a unique identification number and maintained at the CDM office in Libby, MT by the data manager.

4.3.14 Field Surveillances and Audits

The quality of field processes is evaluated by field surveillances and audits conducted by CDM and/or USEPA. This section describes each of these evaluations.

Field surveillances consist of periodic observations made to evaluate continued adherence to investigation-specific governing documents. Field surveillances are conducted for each investigation conducted at the Site, and are most often performed by the CDM investigation field manager (IFM) or investigation assigned FTL.

The schedule for performing field surveillances is dependent on the duration of the investigation, frequency of execution, and magnitude of process changes. At a minimum, field surveillance will be performed daily during the first week of implementation. Following the first week, surveillances will be conducted once a month or as necessary when field processes are revised or other QA/QC procedures indicate potential deficiencies.

When deficiencies are observed during the surveillances, the observer will immediately discuss the observation with the field team member and retrain the team member if required. If the observer finds deficiencies across multiple field members or teams, the IFM or FTL will plan and hold an investigation-specific field meeting. At this meeting the observations made will be discussed as well as any corrective actions required (i.e., retraining).

The observer will document that surveillances have occurred in the appropriate field logbook. The logbook will also be used to record any field meetings that were conducted including topics discussed, person conducting the meeting, and field team members attending the meeting.

Field audits are broader in scope than surveillances and are independent evaluations conducted by qualified technical or QA staff that are independent of the activities audited. Field audits can be conducted by CDM, internal USEPA staff, or USEPA contracted auditors. Due to the brevity of the outdoor worker ABS sampling, a field audit is not anticipated.

4.4 QA/QC Activities

QA/QC samples will be collected for air and soil samples according to the procedures and at the frequencies described below. It is expected that drying air sample cassettes will not be required for this activity given the low relative humidity conditions in which sampling will take place. Co-located samples will not be collected due to the replication of air samples collected over the 8-day sampling event. Table 4-1 summarizes the collection frequency for QA samples and indicates corrective actions that may be required based on their results.

Lot blanks – Before samples are collected, cassette lot blanks from each filter lot will be randomly selected and submitted for analysis at a minimum frequency of 1 lot blank per 500 cassettes. The lot blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. The entire batch of cassettes will be rejected if any asbestos fiber is detected on the lot blanks. Only lots of filters with acceptable lot blank results are placed in the general supply area for use by project personnel.

Field blanks – The collection frequency for field blanks will be one field blank for each day when activities are conducted. Field blanks are collected by opening the sample cassette to the ambient environment for 5 to 30 seconds then re-capping the sample cassette. The field blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. It is expected, based on historical analyses of field blanks, asbestos structures will only be observed on field blanks on very rare occasions. If any asbestos structure is observed on a field blank, the Libby2 database will be used to correlate the field blanks to the related field samples. Based on this correlation, a qualifier of "FB" will be added to the results of all samples associated to a field blank with asbestos structures.

Field Duplicates – Field duplicates are collected from the same land use area as the parent soil sample but from different subsample locations. The duplicate is collected from the same number of subsamples as the parent sample. These samples will be used to determine the variability of sample results in a given land use area. Soil field duplicate samples will be collected at a rate of 1 per 20 (5 %) of the non-QC field samples per investigation, with a minimum of one field duplicate per investigation. Field duplicate samples will be given a unique index ID number from the parent field sample; however, field personnel will reference the index ID of the parent sample in the category section of the FSDS. The same location ID will be assigned to the field duplicate sample as the parent field sample.

5.0 LABORATORY ANALYSIS AND REQUIREMENTS

The laboratories used for all sample analysis will have participated in, and acceptably analyzed, the required parameters in the last two proficiency examinations from the National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program. The laboratory must also analyze project specific performance evaluation samples or other reference materials when requested. These analyses must be performed before any samples are submitted to the laboratory to confirm the laboratory's capabilities and may be subsequently submitted at regular intervals. In addition, the laboratory must participate in the laboratory training program developed by the Libby laboratory team.

5.1 Preparation and Archiving Methods – Soil

All soil samples collected for asbestos analysis by PLM-VE will be transmitted to the CDM soil preparation laboratory in Denver, CO. Samples will be prepared in accordance with ISSI-LIBBY-01 Revision 10 (SRC 2007). In brief, the raw soil sample is split into two aliquots. One aliquot is placed into archive, and the other aliquot is sieved into coarse (> ¼ inch) and fine fractions. The fine fraction is ground to reduce particles to a diameter of 250 µm or less and this fine-ground portion is split into 4 aliquots.

One soil sample collected as part of this sampling effort will be analyzed for soil moisture content in accord with ASTM D2216-05: *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil.*

Samples will subsequently be archived at the CDM closed support facility in Denver, CO.

5.2 Analytical Methods – Air

The high volume personal air samples collected as part of this investigation will be submitted to a subcontracted laboratory for analysis using the International Organization for Standardization (ISO) Transmission Electron Microscopy (TEM) method 10312, also known as ISO 10312:1995(E) (CDM 2005), with all applicable project specific modifications, including LB-000016, LB-000019, LB-000028, LB-000029b, LB-000030, LB-000031a, LB-000053, LB-000066c, LB-000084, and LB-000085 (CDM 2003). All asbestos structures (including not only LA but all other asbestos types as well) that have appropriate diffraction patterns and EDS spectra, and having length greater than or equal to 0.5 µm and an aspect ratio $\geq$ 3:1, will be recorded on the Libby site-specific laboratory data sheets and electronic deliverables.

The personal air samples collected for the ongoing health and safety monitoring do not require the same target analytical sensitivity as the samples collected in support of the risk assessment. Instead, these samples will be collected and analyzed in accordance

with the Response Action SAP, Revision 1 (CDM 2008d) as specified on the associated COC.

5.3 Stopping Rules

Field Samples
For field samples, the initial stopping rules are as follows:

Count the sample until one of the following is achieved:

- A target analytical sensitivity of 0.001 cc-1 is achieved
- 50 LA structures are observed
- An area of 0.5 mm2 of filter has been examined

When one of these goals is achieved, complete the final grid opening and stop. These stopping rules may be revised as data become available on the levels of LA and dust that are collected in the field samples.

Field Blanks and Lot Blanks
For field blanks and lot blanks, examine a filter area of 0.1 mm^2 and stop.

Estimated Filter Area and Grid Opening Requirements
As noted above, the target analytical sensitivity for personal air samples is 0.001 cc^{-1}. Assuming a sample volume of 1200 L, and assuming the sample can be evaluated without indirect preparation, the area of filter that must be examined to achieve the target sensitivity is about 0.32 mm^2. For grids with a grid opening area of about 0.01 mm^2, this would correspond to about 32 GOs. For grids with a different grid opening area, the number of GOs needed to achieve the target sensitivity is given by:

$$\text{Target GOs} = \text{EFA} / (S \cdot \text{Ago} \cdot V \cdot 1000)$$

5.4 Holding Times

No preservation requirements or holding times are established for air samples collected for asbestos analysis.

5.5 Laboratory Custody Procedures and Documentation

Laboratory custody procedures are provided in the laboratories' QA management plan, which are reviewed by CDM as part of the laboratory procurement process and were independently audited and found to be satisfactory by USEPA's Laboratory Audit team.

The basic laboratory sample custody process is as described herein. Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipment and the individual samples. This inspection will include verifying sample integrity. The accompanying COC records will be cross-referenced with all of the samples in the shipment. The laboratory sample custodian will sign the COC records and maintain a copy for their project files; the original COC will be appended to the hard copy data report that is sent to CDM's laboratory coordinator. Next, the sample custodian may continue the COC record process by assigning a unique laboratory number to each sample on receipt. This number, if assigned, will identify the sample through all further handling at the laboratory. It is the laboratory's responsibility to maintain internal logbooks and records throughout sample preparation, analysis, and data reporting.

5.6 Documentation and Records

Laboratory documentation and records will follow the requirements outlined below.

5.6.1 Analytical Data Reports

Data reports for all samples will be submitted to the CDM laboratory coordinator and include a case narrative that briefly describes the number of samples, the analyses, and any analytical difficulties or QA/QC issues associated with the submitted samples. The data report will also include signed COC forms, analytical data summary report pages, a QC package, and raw data, where applicable. Raw data is to consist of instrument preparation logs, instrument printouts, and QC sample results including, instrument maintenance records, COC check in and tracking, raw data instrument print outs of sample results, analysis run logs, and sample preparation logs. All original data reports will be filed in the CDM office in Denver, Colorado. The laboratory also will provide an electronic copy of the data to the laboratory coordinator and others as directed by CDM.

5.6.2 Laboratory Data Entry Spreadsheets

Standardized data entry spreadsheets (electronic data deliverables [EDDs]) were developed specifically for the Libby project to ensure consistency between laboratories in the presentation and submittal of analytical data. In general, a unique data entry MSExcel workbook template was developed for each type of analytical method (TEM, PCM, PLM). Since the beginning of the Libby project, the EDD has evolved to better accommodate the present and future needs of data handling, retrieval, and interpretation. An on-going refinement of the EDD continues based on laboratory and data user input.

The EDD template contains a variety of built-in quality control functions that improve accuracy of data entry and help maintain data integrity. For example, data entry forms utilize drop-down menus whenever possible to standardize data inputs and prevent transcription errors. In addition, many data input cells are coded to highlight omissions, apparent inconsistencies, or unexpected values so that data entry personnel can check and correct any errors before submittal of the EDD. The spreadsheet workbook also performs

automatic computations of sensitivity, dilution factors, and concentration, thus reducing the likelihood of analyst calculation errors. The EDD was designed to directly upload data into the project database, avoiding any additional data entry requirements.

5.6.3 Modification Forms

All deviations from project specific and method guidance documents will be recorded on the Libby Asbestos Project Record of Modification Form to Laboratory Activities. The Record of Modification Form will be used to document all permanent and temporary changes to analytical procedures. In addition, the Record of Modification Form will be used to document any information of interest as requested by USEPA project management. As modifications are implemented, the laboratory coordinator will communicate the changes to the project laboratories.

Record of Modification Forms are completed by the case manager assigned by each laboratory to the Libby project or their designate. Once a form is completed a technical review is completed by the laboratory and the Volpe Center project manger or designate, and then reviewed and approved by the USEPA project leader or designate.

A record is kept to track the person each form was completed by and a brief description of the modification documented on each form. Each completed Record of Modification Form is assigned a unique identification number and maintained by the CDM laboratory coordinator.

5.7 Data Management

Sample results data will be delivered to the Volpe Center in Cambridge, MA and CDM's Cambridge, MA office both in hard copy and as an EDD in the most recent project-specific format. Electronic copies of all project deliverables, including graphics, will be filed by project number. Electronic files will be routinely backed up and archived according to individual laboratory processes.

All results, field data sheet information, and survey forms will be maintained in the Libby project database managed by the Volpe Center under the oversight of the Volpe Center database management team.

6.0 REFERENCES

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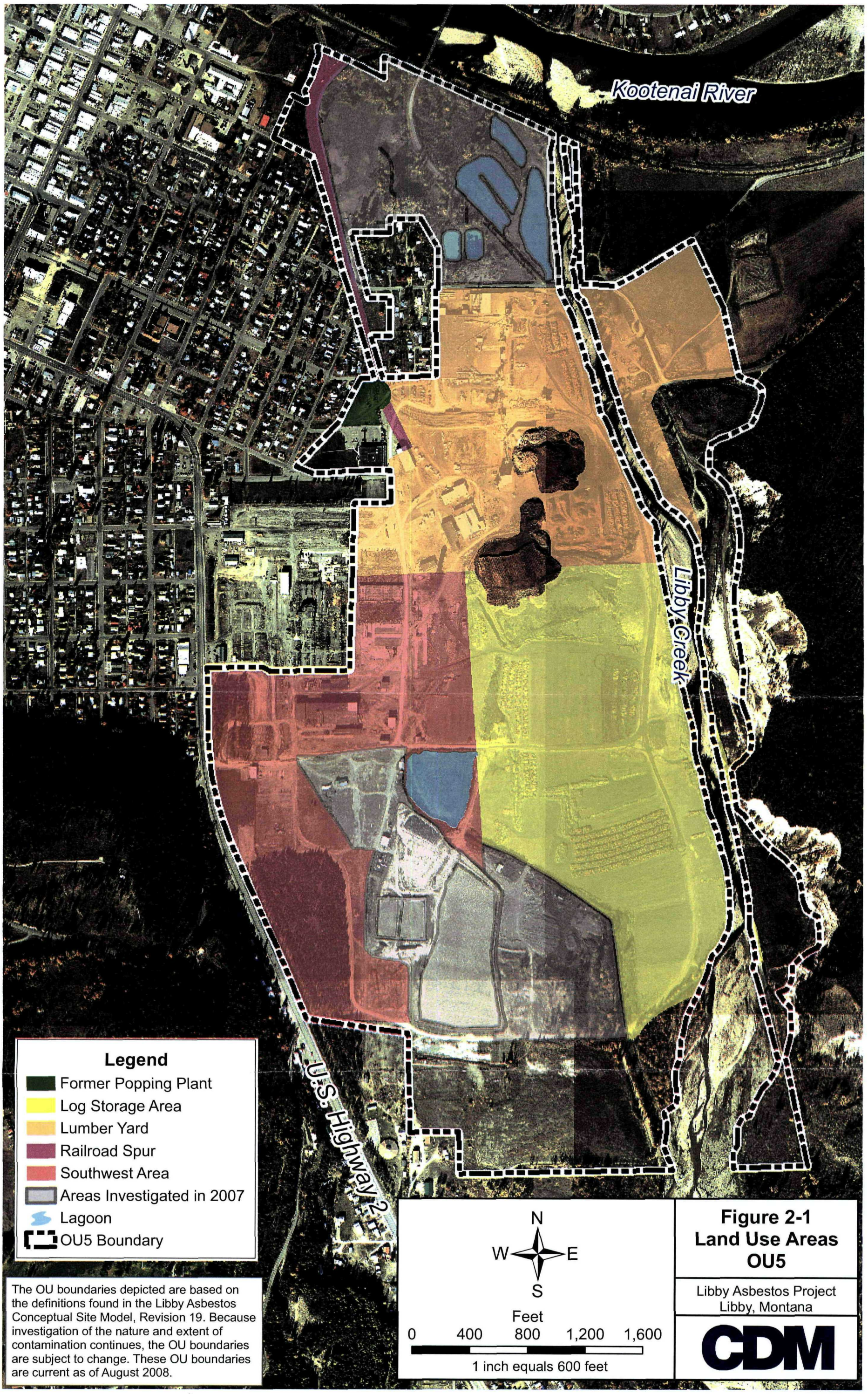

Kootenai River
Libby Creek
U.S. Highway 2
Legend
Former Popping Plant
Log Storage Area
Lumber Yard
Railroad Spur
Southwest Area
Areas Investigated in 2007
Lagoon
OU5 Boundary
The OU boundaries depicted are based on the definitions found in the Libby Asbestos Conceptual Site Model, Revision 19. Because investigation of the nature and extent of contamination continues, the OU boundaries are subject to change. These OU boundaries are current as of August 2008.
N
W
E
S
Feet
0
400
800
1,200
1,600
1 inch equals 600 feet
Figure 2-1
Land Use Areas
OU5
Libby Asbestos Project
Libby, Montana
CDM
Document: R:\2603-Volpe\Stimson\Figure2-1_OU5_LanduseAreas.mxd

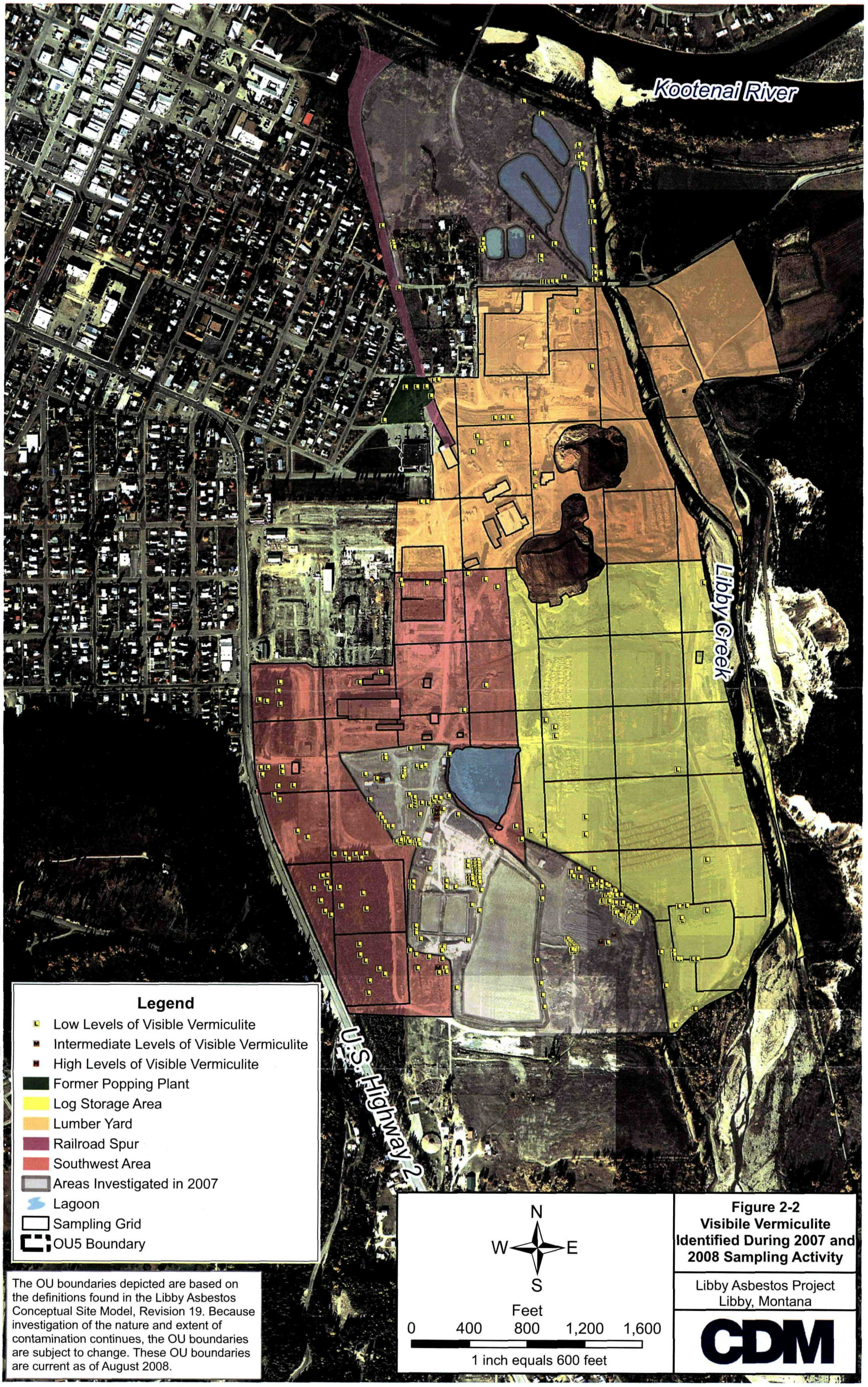
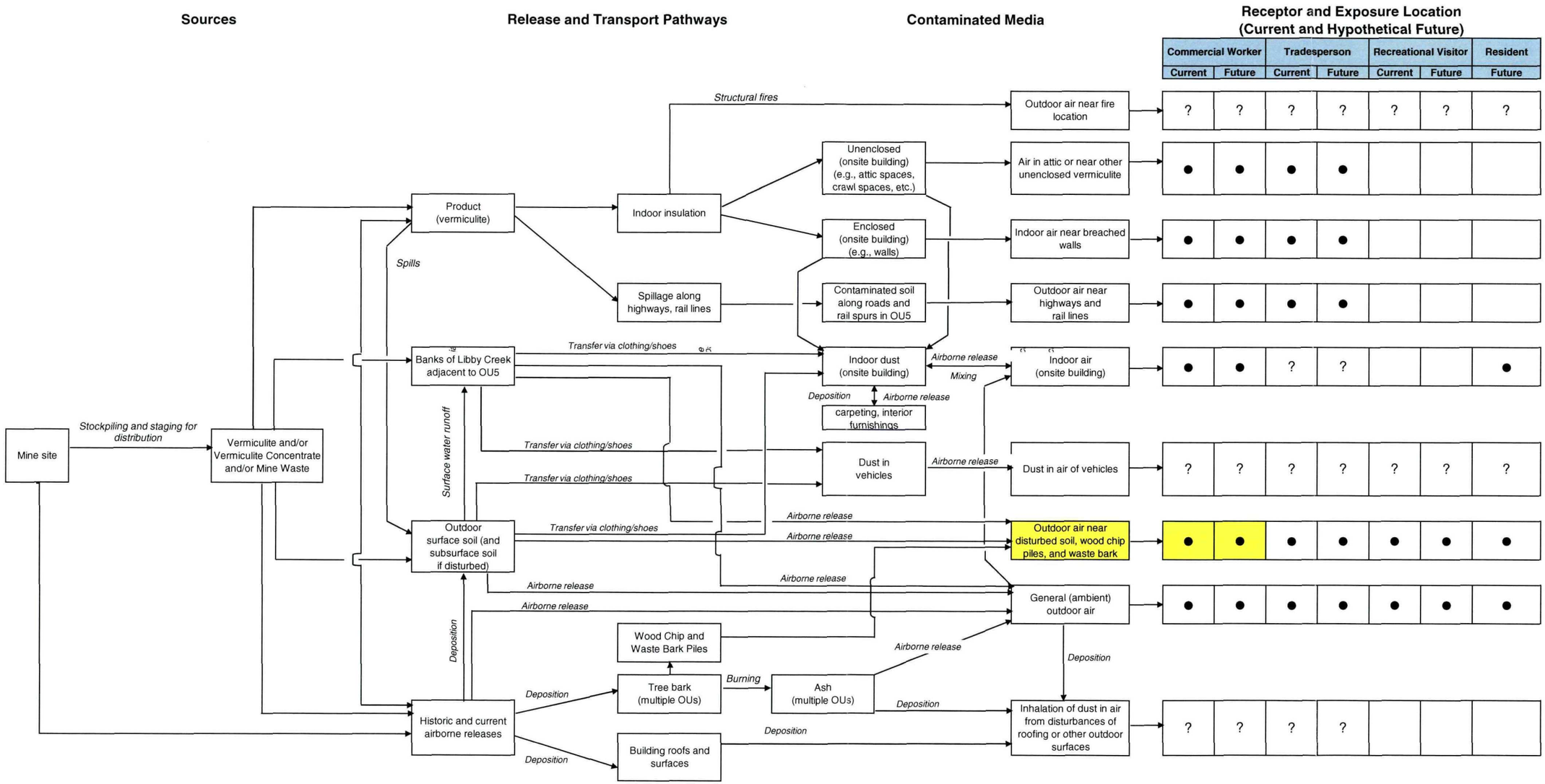

Kootenai River
Libby Creek
U.S. Highway 2
Legend
Low Levels of Visible Vermiculite
Intermediate Levels of Visible Vermiculite
High Levels of Visible Vermiculite
Former Popping Plant
Log Storage Area
Lumber Yard
Railroad Spur
Southwest Area
Areas Investigated in 2007
Lagoon
Sampling Grid
OU5 Boundary
The OU boundaries depicted are based on the definitions found in the Libby Asbestos Conceptual Site Model, Revision 19. Because investigation of the nature and extent of contamination continues, the OU boundaries are subject to change. These OU boundaries are current as of August 2008.
N
W
E
S
Feet
0
400
800
1,200
1,600
1 inch equals 600 feet
Figure 2-2
Visibile Vermiculite Identified During 2007 and 2008 Sampling Activity
Libby Asbestos Project
Libby, Montana
CDM
Document: R:\2603-Volpe\Stimson\Figure2-2_OU5_VisibleVermiculite_2007-2008.mxd

FIGURE 2-3. CONCEPTUAL SITE MODEL FOR INHALATION EXPOSURES TO ASBESTOS

Libby Superfund Site -- Operable Unit 5 (Former Stimson Lumber Mill)

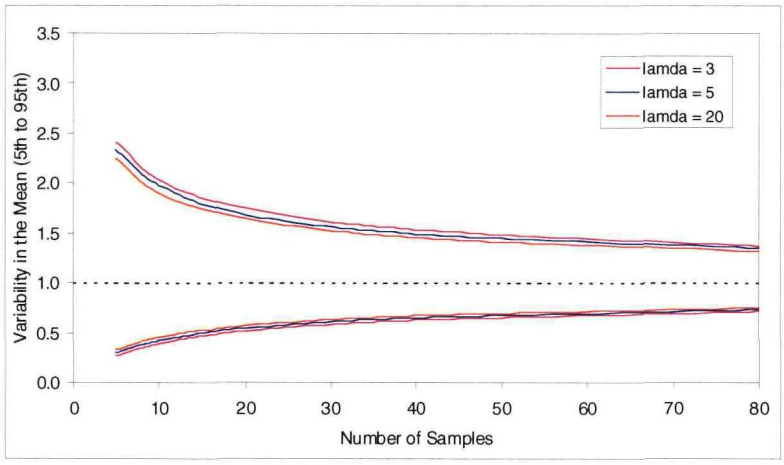


KEY

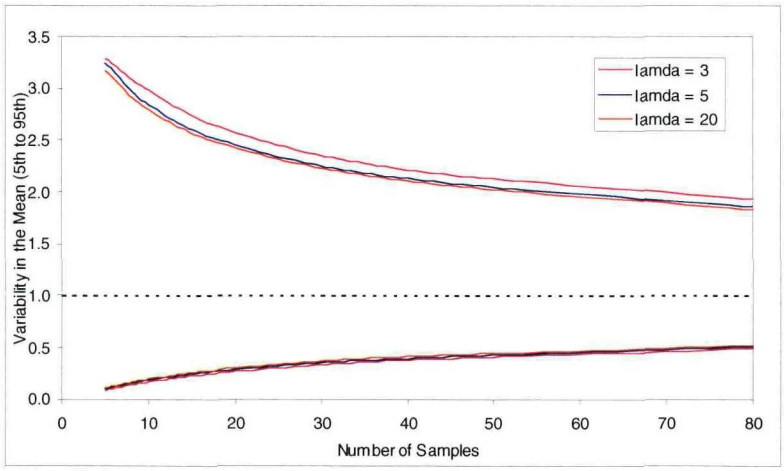
●	Pathway is complete and exposure may be significant; quantitative evaluation is warranted
O	Pathway is complete but is believed to be minor in comparison to other pathways; qualitative evaluation is warranted
?	Pathway may be complete but magnitude of exposure is uncertain; further investigation may be necessary
	Pathway is incomplete or believed to be negligible; further evaluation is not warranted

FIGURE 3-1
EFFECT OF SAMPLE SIZE ON UNCERTAINTY IN THE MEAN

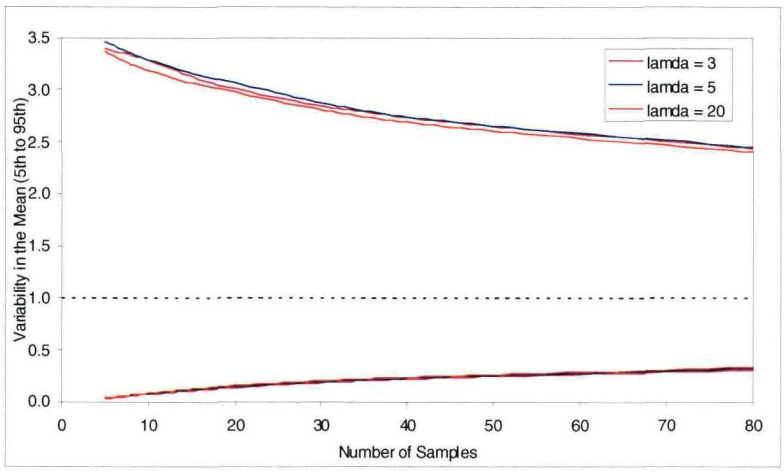
GSD = 3



GSD = 6



GSD = 10



Kootenai River

Libby Creek

U.S. Highway 2

LY4 LY17 LY8 LY5 LY9 LY14 Area 5 LY6 LY3 Area 4 LY20 LY7 LY15 Area 2 SW10 SW14 LS1 LS6 LS13 Luck EG Post & Rail SW5 SW11 SW15 LS2 LS7 LS14 SW1 SW12 Area 1 LS3 LS8 LS15 SW2 SW6 Area 6 Area 3 LS4 LS9 LS16 SW3 LS5 LS10 SW4 LS17 Area 8 SW8 Area 7 LS18 SW9 SW13

Legend

- Low Levels of Visible Vermiculite
- Intermediate Levels of Visible Vermiculite
- High Levels of Visible Vermiculite
- Former Popping Plant
- Log Storage Area
- Lumber Yard
- Railroad Spur
- Southwest Area
- Areas Investigated in 2007
- Lagoon
- Sampling Locations
- Sampling Grid
- OU5 Boundary

The OU boundaries depicted are based on the definitions found in the Libby Asbestos Conceptual Site Model, Revision 19. Because investigation of the nature and extent of contamination continues, the OU boundaries are subject to change. These OU boundaries are current as of August 2008.

N
W E
S

Feet
0 400 800 1,200 1,600

1 inch equals 600 feet

Figure 4-1
Selected ABS Study Areas for Outdoor Workers at OU5

Libby Asbestos Project
Libby, Montana

CDM

Document: R:\2603-Volpe\Stimson\Figure4-1_OU5_ABS_StudyAreas.mxd

TABLE 3-1
Visible Inspection Scores and Selected Locations for Outdoor Worker ABS

Area	Location	Visible Inspection Result:					
		None	Low	Med	High	Score:	Category
1	Luck EG (w/in SW12)	30	0			0.00	None
2	LS06	30	0			0.00	None
3	LS04	28	2			0.07	Low
4	LY03	28	2			0.07	Low
5	LY06	26	4			0.13	Medium
6	SW03	26	4			0.13	Medium
7	SW13	21	8	1		0.37	High
8	Nursery shed	6	20	3	1	1.30	High

TABLE 3-2
SUMMARY OF OUTDOOR WORKER ABS DESIGN

Item	Description
Conceptual Model	See Figure 2-3 (relevant pathway highlighted)
Representativeness	Represents personal air for outdoor workers who disturb soil both while on foot and while using machinery (e.g., bobcat); intended to be a generally representative scenario
Exposure parameters assumed in calculation of target sensitivity	ET = 8 hrs/day EF = 200 days/yr Age at start = 20 Exposure duration = 25 years
Toxicity Factors assumed in calculation of RBC	Cancer Target cancer risk = 1E-05 Unit $Risk_{20\text{-}45}$ = 0.069 $(PCM\ f/cc\text{-}yrs)^{-1}$ RBC = 0.002 Total LA f/cc Non-Cancer iRfC = NA
Analytical Requirements	Method = ISO 10312 with all applicable site-specific laboratory modifications Target Sensitivity = 0.001 cc^{-1} (corresponds to 5E-06 risk level) Stopping rules: a) Target S (approx 40 GO expected) b) Max GO = 60 c) Max LA = 50
Initial number of samples (a)	4 soil levels · 2 areas per level · 2 workers · 2 events = 32

(a) The number of samples needed for risk assessment and risk management depends on the inter-sample variability and how close the data are to a decision threshold. This number of samples is expected to provide sufficient information to determine if additional samples are needed, and if so, how many.

TABLE 4-1 SUMMARY OF FIELD QC SAMPLES BY MEDIA

Media	Sample Type	Minimum Collection Frequency		Minimum Analysis Frequency	Acceptance Criteria	Acceptance Criteria Failure Action
Air	Lot Blank	1 per 500 cassettes	0.2%	100%	ND for all asbestos	Rejection of all cassettes in lot
	Field Blank	1 per day		10% of total collected per week	ND for all asbestos fibers	Analysis of additional field blanks to determine source of potential cross-contamination, qualification of sample results, evaluation of field sample handling procedures
Soil	Field Duplicate	1 per 20 samples	5%	100%	<30% RPD	Evaluation of sample collection techniques

Notes: QC - quality control; ND - nondetect; RPD - relative percent difference; COC - chain of custody

APPENDIX A
"SCRIPT" FOR GENERIC OUTDOOR WORKER SCENARIO

"SCRIPT" FOR GENERIC OUTDOOR WORKER SCENARIO

The following is an activity script for the outdoor worker participants, which briefly describes the specific type of activity that will be monitored for this SAP.

Outdoor Worker Scenario. Each 120-minute scenario will consist of two parts: raking and operating a bobcat. The two participants will work simultaneously in the same scenario area for the duration of the sampling. A third team member will keep detailed records of the sampling activities as well as monitoring the 2 active participants to ensure there is a safe distance between the bobcat operator and raking participant.

After 60 minutes of sampling has passed, the participants will pause the activity and exchange the sampling pumps and associated cassettes. This will be done so that each sample will represent both activities. The exchange is anticipated to take less than 60 seconds, so the sampling pumps and event time clock will not be halted during the exchange. If the exchange requires more than 60 seconds, the pump and event clock will be stopped until activity is re-initiated.

The monitoring cassette will be affixed to the shoulder of the participant within their breathing zone. The sampling pump will either be carried in a backpack (raking) or placed in the cab of the bobcat with the operator.

Raking: The participant will rake the scenario area with a metal leaf rake that is approximately 20 to 28 inches wide. The participant should strive to disturb the top half-inch of soil with an aggressive raking motion. Raking will occur in an arched motion raking from the left of the participant to the right. The participants will rake the debris towards themselves facing one side of the square for 15 minutes then the participant will turn 90 degrees clockwise and begin a new side. Participants will continue to rake each side of the square and rotate 90 degrees.[1] Any debris accumulated while raking will be redistributed around the scenario area as the participant progresses through the scenario area.

Bobcat: A qualified equipment operator (as determined by years of experience and level of familiarity with the specific equipment) will move items and maneuver the bobcat around the scenario area for the entire sampling period. The bobcat will travel in a forward motion but the path through the scenario area is not predetermined, as long as an approximately equivalent time is spent facing each compass direction.

---

[1] Specifications for Raking were excerpted from EPA Emergency Response Team Standard Operating Procedure #2084; Activity Based Air Sampling for Asbestos, Section 7.5.

Each scenario area will be sampled twice, once in the morning and once in the afternoon, however these two periods will not occur on the same day. The morning sampling period will be conducted from approximately 08:00 to 10:00 and the afternoon sampling period will be conducted from approximately 14:00 to 16:00.

Example: Day 1- Scenario Area 1 will be sampled in the morning
Scenario Area 2 will be sampled in the afternoon

Day 5- Scenario Area 2 will be sampled in the morning
Scenario Area 8 will be sampled in the afternoon

Each participant will don appropriate PPE as specified in the Outdoor Worker HASP for OU5.

Equipment decontamination. The rake and bobcat used during the investigation will be decontaminated in between each scenario area using a pressurized water source to remove accumulated material.

APPENDIX B
STANDARD OPERATING PROCEDURES
(provided electronically)

SOP Description	SOP ID
Sample Custody	CDM SOP 1-2, with modification
Packaging and Shipping of Environmental Samples	CDM SOP 2-1, with modification
Guide to Handling of Investigation-Derived Waste	CDM SOP 2-2, with modification
Field Logbook Content and Control	CDM SOP 4-1, with modification
Photographic Documentation of Field Activities	CDM SOP 4-2, with modification
Field Equipment Decontamination at Nonradioactive Sites	CDM SOP 4-5, with modification
Control of Measurement and Test Equipment	CDM SOP 5-1
Standard Operating Procedure (SOP) for the Sampling of Asbestos Fibers in Air	EPA-LIBBY-01 Rev. 1
Soil Sample Collection at Residential and Commercial Properties	CDM-LIBBY-05, Rev. 2
Semi-Quantitative Visual Estimation of Vermiculite in Soils at Residential and Commercial Properties	CDM-LIBBY-06, Rev. 1
Global Positioning Satellite Coordinate Collection and Handling	CDM-LIBBY-09, Rev. 0
Texture Classification; United States Department of Agriculture, Natural Resources Conservation Service	N/A

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1100454

SITE NAME: LIBBY ASBESTOS

DOCUMENT DATE: 09/08/2008

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☑ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

1 CD - APPENDIX B, STANDARD OPERATING PROCEDURES

Contact the Superfund Records Center to view available document.
(303) 312-6473

APPENDIX C
FIELD SAMPLE DATA SHEETS

Sheet No.: S- **00«seq»**

LIBBY FIELD SAMPLE DATA SHEET (FSDS) FOR SOIL

Field Logbook No: _____ Page No: _____ Sampling Date: _____

Address: _____ Owner/Tenant: _____

Business Name: _____

Land Use: Residential School Commercial Mining Roadway Other ( )

Sampling Team: CDM Other _____ Names: _____

Data Item	Sample 1	Sample 2	Sample 3
Index ID			
Location ID			
Sample Group			
Location Description (circle)	Back yard Front yard Side yard Driveway Other _____	Back yard Front yard Side yard Driveway Other _____	Back yard Front yard Side yard Driveway Other _____
Category (circle)	FS FD of _____ EB LB	FS FD of _____ EB LB	FS FD of _____ EB LB
Matrix Type (Surface soil unless other wise noted)	Surface Soil Other _____	Surface Soil Other _____	Surface Soil Other _____
Type (circle)	Grab Comp. # subsamples _____	Grab Comp. # subsamples _____	Grab Comp. # subsamples _____
GPS Status (circle)	Collected Previously Collected Not Collected-no signal (3 attempts) Not Collected-not required for sample	Collected Previously Collected Not Collected-no signal (3 attempts) Not Collected-not required for sample	Collected Previously Collected Not Collected-no signal (3 attempts) Not Collected-not required for sample
GPS File (fill in or circle)	Filename:_____ NA	Filename:_____ NA	Filename:_____ NA
Sample Time			
Top Depth (inches below ground surface)			
Bottom Depth (inches below ground surface)			
Field Comments *Note if vermiculite is visible in sampled area*	BD-_____	BD-_____	BD-_____
Entered (LFO) _____	Volpe: Entered _____ Validated _____	Volpe: Entered _____ Validated _____	Volpe: Entered _____ Validated _____

For Field Team Completion (Provide Initials)	Completed by:	QC by:

vs 10507

Sheet No.: PA- **00«seq»**

LIBBY FIELD SAMPLE DATA SHEET (FSDS) FOR PERSONAL AIR

Field Logbook No: _____ Page No: _____ Sampling Date: _____

Address: _____ Owner/Tenant: _____

Business Name: _____

Land Use: Residential School Commercial Mining Roadway Other ( )

Sampling Team: CDM Other _____ Names: _____

Person Sampled/Co. Name: _____ / _____ SSN: _____ Task: _____

Data Item	Cassette 1	Cassette 2	Cassette 3
Index ID			
Location ID			
Sample Group			
Location Description			
Category (circle)	FS FB-(field blank) LB-(lot blank)	FS FB-(field blank) LB-(lot blank)	FS FB-(field blank) LB-(lot blank)
Matrix Type (circle)	Indoor Outdoor	Indoor Outdoor	Indoor Outdoor
Filter Diameter (circle)	25mm 37mm	25mm 37mm	25mm 37mm
Pore Size (circle)	TEM- .45 PCM- 0.8	TEM- .45 PCM- 0.8	TEM- .45 PCM- 0.8
Flow Meter Type (circle)	Rotometer DryCal NA	Rotometer DryCal NA	Rotometer DryCal NA
Pump ID Number			
Flow Meter ID No.			
Start Date			
Start Time			
Start Flow (L/min)			
Stop Date			
Stop Time			
Stop Flow (L/min)			
Pump fault? (circle)	No Yes NA	No Yes NA	No Yes NA
MET Station onsite?	No Yes NA	No Yes NA	No Yes NA
Sample Type	TWA EXC NA	TWA EXC NA	TWA EXC NA
Field Comments Cassette Lot Number: _____	Archive Blank (circle): Yes No	Archive Blank (circle): Yes No	Archive Blank (circle): Yes No
Entered (LFO) _____	Volpe: Entered _____ Validated _____	Volpe: Entered _____ Validated _____	Volpe: Entered _____ Validated _____

For Field Team Completion (Provide Initials)	Completed by	QC by

vs 042308

APPENDIX D
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

Requirements Revision #: 0
Effective Date: 09-08-08

SAP ANALYTICAL SUMMARY # OU5OUTWK (SRC 2008)
SUMMARY OF PREPARATION AND ANALYTICAL REQUIREMENTS FOR ASBESTOS

SAP Title: Final Sampling and Analysis Plan for Outdoor Workers Exposure at Operable Unit 5, Libby Asbestos Superfund Site, Libby, Montana

SAP Date/Revision: 09-08-08/N/A

EPA Technical Advisor: Kathryn Hernandez (303-312-6101, hernandez.kathryn@epa.gov)
(contact to advise on DQOs of SAP related to preparation/analytical requirements)

Sampling Program Overview: Collection of a series of activity-based samples (ABS) personal air samples within OU5 of the Libby Asbestos Superfund Site during generic outdoor worker activities. Additional personal air samples will be collected for health and safety monitoring. Soil samples will also be collected from each scenario area, but will initially be archived.

Index ID Prefix: SL-

Medium-Specific TEM Preparation and Analytical Requirements for Field Samples:

Medium Code	Sample Type	Preparation Details				Analysis Details			Applicable Laboratory Modifications
		Investigative? (a)	Indirect Prep? (a,b)		Filter Archive? (b)	Method	Recording Rules	Analytical Sensitivity/ Stopping Rules	
			With Ashing (b)	Without Ashing (b)					
A	Outdoor ABS Personal Air Samples	Yes	Yes – if ≥ 30% loaded with organic material	Yes - if overloaded or unevenly loaded material on filter	Yes	TEM – ISO 10312	All asbestos $L \geq 0.5$um $AR \geq 3:1$	Count until one is achieved (i) Target S = 0.001 cc^{-1} (ii) 50 LA found, or (iii) An area of 0.5 mm^2 of filter evaluated (iv) For Chrysotile only: 50 found	LB-000016, LB-000019, LB-000028, LB-000029b, LB-000030, LB-000031a, LB-000053, LB-000066c, LB-000084, LB-000085
B	Health and Safety Personal Air Samples	No	No	Yes - if overloaded or unevenly loaded material on filter	Yes	PCM – NIOSH 7400 TEM – AHERA (upon request)	If AHERA is requested; All asbestos	For AHERA: evaluate 0.1 mm^2 of filter area	LB-000015, LB-000017a, LB-000019, LB-000028, LB-000029b, LB-000030, LB-000031a, LB-000053, LB-000066c, LB-000067, LB-000084, LB-000085

(a) See LB-000053 for additional details
(b) See most current version of EPA-LIBBY-08 for preparation details

TEM Preparation and Analytical Requirements for Quality Control Samples:

Medium Code	Sample Type	Preparation Details			Analysis Details			Applicable Laboratory Modifications
		Indirect Prep?		Archive?	Method	Recording Rules	Stopping Rules	
		With Ashing	Without Ashing					
C	Field Blank	No	No	Yes	TEM – ISO 10312	All asbestos L ≥ 0.5um AR ≥ 3:1	Evaluate 0.1 mm^2 of filter area	LB-000016, LB-000019, LB-000028, LB-000029b, LB-000030, LB-000031a, LB-000053, LB-000066c, LB-000084, LB-000085
D	Lot Blank	No	No	Yes	TEM – ISO 10312	All asbestos L ≥ 0.5um AR ≥ 3:1	Evaluate 0.1 mm^2 of filter area	LB-000016, LB-000019, LB-000028, LB-000029b, LB-000030, LB-000031a, LB-000053, LB-000066c, LB-000084, LB-000085

PLM Preparation and Analytical Requirements: N/A

Medium Code	Preparation Method	Analysis Method	Applicable Laboratory Modifications
E	ISSI-Libby-01 Rev. 10	SRC-LIBBY-01, Rev. 2 SRC-LIBBY-03 Rev. 1	LB-000024b, LB-000073, LB-000072

Laboratory Quality Control Frequencies:

TEM: Lab Blank – 4%
Recount Same – 1%
Recount Different – 2.5%
Verified Analysis – 1%
Repreparation – 1%

PLM: Lab Duplicate – 10%

Requirements Revision:

Revision #:	Effective Date:	Revision Description
0	09-08-08	N/A

Analytical Laboratory Review Sign-off:

- ☒ Batta [sign & date: Bo Li, 9/8/08]
- ☒ EMSL-Libby [sign & date: R.K. Mahoney 5 September 2008]
- ☒ EMSL – Westmont [sign & date: Charles LaCerra, 9/8/08]
- ☒ EMSL – Beltsville [sign & date: Joseph M. Centifonti 9/9/08]
- ☒ ESAT [sign & date: Douglas Kent 09/09/08]
- ☒ Hygeia [sign & date: Kyeong Corbin 9/5/08]
- ☒ MAS [sign & date: Mike Mount 9/10/08]
- ☒ RESI [sign & date: Jeanne Orr 9/9/08]

[Checking the box and initialing above indicates that the laboratory has reviewed and acknowledged the preparation and analytical requirements associated with the specified SAP.]

APPENDIX E
RECORD OF MODIFICATION FORM

Record of Modification

to the

Libby Sampling and Quality Assurance Project Plan

Field Activities

LFO-0000__

Instructions to Requester: **Fax to contacts at bottom of form for review and approval.**
File approved copy with Data Manager at the Libby Field Office (LFO).
Data Manager will maintain legible copies in a binder that can be accessed by LFO personnel.

Project QAPP (circle one): Phase I (approved 4/00) Phase II (approved 2/01)
Removal Action (approved 7/00) Contaminant Screening Study (approved 5/02)
Other (Title and approval date):_____

SOP (Number and Revision No.):_____
_____
_____

Other Document (Title, Number/Revision): _____

Requester: _____ Title: _____
Company: _____ Date: _____

Description of Modification (attach additional sheets if necessary; state section and page numbers of SQAPP when applicable):_____
_____
_____
_____

Field logbook and page number Modification is documented on: _____

Implications of Modification: _____
_____
_____
_____

Duration of Modification (circle one):
Temporary Date(s):_____
Resident address(es): _____
_____

- If appropriate, attach a list of all applicable Index Identification numbers.

Permanent (complete Proposed Modification Section) Effective Date:_____

Potential Implications of Modification:_____
_____
_____
_____

Technical Review and Approval: _____ Date:_____
(Volpe Project Manager or designate)

EPA Review and Approval: _____ Date:_____
(USEPA RPM or designate)